

## Self-Powered Magnetothermal Fluid Pump, Phase II

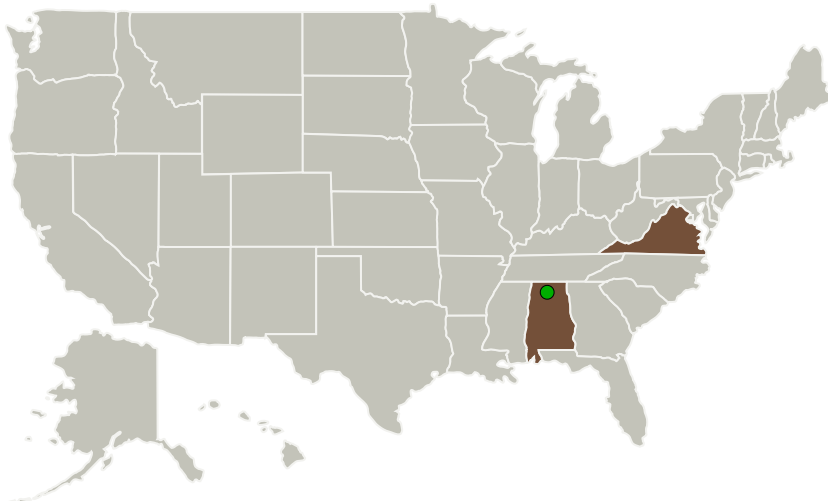
Completed Technology Project (2014 - 2016)



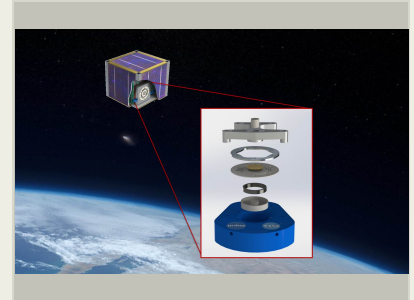
## Project Introduction

Advances in the capabilities of electronics have enabled high power density devices. However, even in light of advances in electronics efficiency figures, the increased power density operational points result in the generation of excess heat. In order to maintain efficiency and to protect sensitive components from thermally-induced failure, intelligent rejection of thermal energy is often a critically limiting constraint in system development. Novel concepts for thermal management are particularly necessary in applications with finite energy stores, such as long-duration space missions. The Prime Photonics magnetothermal fluid pump provides for game-changing, autonomous self-powered thermal management systems. Our self-powered pump converts excess thermal energy into point-of-use mechanical energy with a low mass insertion penalty. The operational frequency of the pump is proportional to the magnitude of the thermal gradient, supplying additional pump capacity in response to increased thermal loads.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Prime Photonics, LC	Lead Organization	Industry	Blacksburg, Virginia
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama



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## Primary U.S. Work Locations

Alabama

Virginia

## Project Transitions

 **April 2014:** Project Start

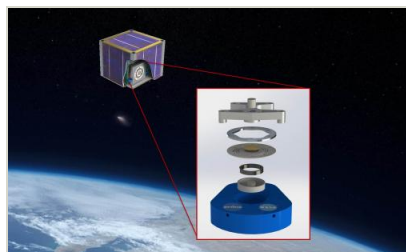
 **April 2016:** Closed out

**Closeout Summary:** Self-Powered Magnetothermal Fluid Pump, Phase II Project Image

### Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/137456>)

## Images



### Briefing Chart Image

Self-Powered Magnetothermal Fluid Pump, Phase II  
(<https://techport.nasa.gov/image/126181>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Prime Photonics, LC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

David Gray

### Co-Investigator:

David K Gray

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### Technology Maturity (TRL)

Start: **4**  
Current: **5**  
Estimated End: **5**



### Technology Areas

#### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.3 Power Management and Distribution
    - └ TX03.3.2 Distribution and Transmission

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System